ACT/053/002

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DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS, AND MINING
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June 20, 1978

Mr. Jerry Glazier
5-M Corporation
P.O. Box 752
Hurricane, UT. 84737

Dear Mr. Glazier:

where are these? (Red Folder - Predesign conference)

We have reviewed your responses to my May 24th 1978 letter and in general agree with your responses. We do however have the following comments to make and request your responses to same.

1. The combination of both underground mining and continuous back-filling of stripped pits will be most complicated. We do not agree with your bulkhead support approach and suggest that even with terracing the broken rock backfilling will be potentially unstable on the clay strata footwall. The broken rock loaded above a bulkhead will have no cohesive strength and less than optimum shear strength so that the potential plane of failure more closely approximates true Coulomb theory thrusts with the line of action higher up on the wall. Also, rigidly supporting the retaining wall with rock bolts and steel braces will not allow for the necessary yielding to mobilize backfill shear strain. The deposition of backfill material up slope from the bulkheads will also result in rocks rolling down slope towards the portal sites. Traffic and haulroad interference problems can also occur by operating portals below active fill slopes and above active pits.

   For the above reasons, we suggest that you spread the portal site spacing out as far as possible and locate the portals in either temporarily unreclaimed strip pits or higher up the dip slope so that no backfilled material is up slope from the portals. Locating the portals in empty pits will require temporary stockpiling of waste near the portals and a few acres per portal site of unreclaimed land during underground mining. Locating the portals on a higher wedge of solid rock will put the portals above the tapered, loose backfill material and closer to ridge top haulroads, however, longer inclines would result. In either case, the portals would be in safer locations than that which you propose.

2. No underground mining will be permitted beneath residences at this time. If such future underground mining is necessary, detailed mining plans showing overburden depths and extraction ratios will be required.

3. Fugitive dust from roads, crushers, etc. should be minimized with wetting.

4. The concerns of the nearby home owners would be greatly relieved if diligent supervision of employees and operations security is enforced. We are sure that this will be standard operating procedure for 5-M.

5. You should ensure that all blasting will be carried out according to the appropriate safety regulations of the Industrial Commission. We suggest that local concerns could be alleviated if you volunteer to apply the following suggestions:

   a. Blast only during daylight working hours and only after a proper warning siren.

   b. Attempt to blast only according to a set schedule. This may be more practical during full production than during construction and development, but is greatly appreciated by neighbors.

   c. Send a notice letter to all nearby residences and businesses which explains the blasting procedures and schedule or publish same in the local paper.

   d. Keep a record of all shots for (2) two years. Record location of shot, explosive type and weight, date, time.

   e. To protect your interests, you might offer to have a qualified contractor inspect all residences within ½ mile of blasting locations, prior to blasting.

6. We do not concurr with your hydrologic design. The following observations and recommendations are included for your review and response.

   a. Enclosed are copies of three hydrographs of the probable maximum thunderstorm for the west, east, and combined drainages draining into the holding pond. The Division anticipates that the NRC will require that surface drainage facilities be designed for this storm. However, the Division would consider it adequate design if the diversions were designed for the 100 year, 6 hour storm as long as the heap leach dams were designed for the probable maximum thunderstorm.

b. The heap leach areas are located in the west drainage. Peak flow resulting from the probable maximum thunderstorm is estimated to be 565 cfs at the holding pond dam. A trapezoidal diversion ditch with an eight (8) foot wide base, with 2h:1v side slopes, and a 2.5 foot depth would pass the peak flow (assuming a slope of 0.046 and manning's coef. of 0.025). Peak flow velocity within the channel would be 18 feet per second. This would require two (2) foot diameter riprap. If you do not wish to use riprap, the maximum allowable velocity for sandy loam soil to control erosion is 2.5 feet per second. This would require a much larger channel.

Because of the steep slope on the White Reef and the need to riprap the diversions, we feel that a design based on the 100 year, 6 hour flood should be used for the diversions. This would allow narrower ditches and lower flow velocities.

c. If the diversions are designed for the probable maximum thunderstorm the heap leach dams should be designed so that 7.5 inches of rainfall on the heap leach area would not cause failure. If the diversions are designed for a lesser storm the heap leach dams should be designed so that 7.5 inches of direct precipitation plus overflow from the diversions resulting from the probable maximum thunderstorm would not cause failure.

d. The holding pond size could be reduced. Direct precipitation on the pond plus runoff from the two (2) drainages, assuming no runoff from the heap leach area, constitutes the storage requirements. This data has been estimated and is listed here for storms of various return periods.

Storm	Precipitation	Runoff	Total Storage
100 yr,6 hr	2.5 inches	1.53 inches	21.5 acre feet
100 yr,24 hr	2.9 inches	1.89 inches	26.5 acre feet
PMT	7.5 inches	6.31 inches	86 acre feet

7. We also have a concern regarding your leaching operation which will involve a spray system. Mitigative measures should be taken to ensure that no leach solution mist or droplets is released into the atmosphere where it may cause a problem to the surrounding soil or vegetation, or to the animal or human population.

8. We have consulted a number of other State agencies for their comments on your project. We will copy their comments to you.

In general, we have appreciated your quick and detailed responses in the past and look forward to your further cooperation. We anticipate no major delays in our approval of this project, but find it likely that the neighboring families may request a Hearing to involve the Board in this highly visible development.

Sincerely,

Brian W. Buck
Engineering Geologist

Enclosures

Worksheet – Direct runoff Determination, in Area inches & Acre-feet volume, to be contained by each Leach Area.

Area		Acres	SCS Curve No.	Runoff (inches)	Runoff (inches)	Runoff (inches)	Runoff (inches)	Runoff (inches)	Runoff (inches)	Runoff (inches)	Runoff (inches)	Runoff (inches)	Runoff (inches)	Runoff (inches)
Storm				2 year, 6 hour Storm. P = 0.95 inches. Probability of being exceeded in any 30 year Period = 99.99 %	5 year, 6 hour Storm. P = 1.35 inches. Probability of being exceeded in any 30 year Period = 99.87 %	10 year, 6 hour Storm. P = 1.65 inches. Probability of being exceeded in any 30 year Period = 95.76 %	50 year, 6 hour Storm. P = 2.20 inches. Probability of being exceeded in any 30 year Period = 45.45 %	100 year, 6 hour Storm. P = 2.50 inches. Probability of being exceeded in any 30 yr. Period = 26.03 %	Probable Maximum Thunderstorm. P = 6 inches. 1 hour point value of rainfall	10 year, 24 hour Storm. P = 1.90 inches. Probability of being exceeded in any 30 year Period = 95.76 %	25 year, 24 hour Storm. P = 2.30 inches. Probability of being exceeded in any 30 year period = 70.61 %	50 year, 24 hour storm. P = 2.70 inches. Probability of being exceeded in any 30 year Period = 45.45 %	100 year, 24 hour Storm. P = 2.90 inches. Probability of being exceeded in any 30 year period = 26.03 %	Probable maximum General Storm. P = 5 inches. 6 hour point value of rainfall
Leach Area 1	Pit	2.09	100	0.95	1.35	1.65	2.20	2.50	6.0	1.90	2.30	2.70	2.90	5.0
	Watershed	4.67	90	0.29	0.57	0.80	1.27	1.53	4.85	1.01	1.35	1.71	1.89	3.88
	Total	6.76	93	0.41	0.74	1.0	1.50	1.78	5.18	1.22	1.59	1.97	2.16	[illegible]
Total runoff to be held in Leach Pit 1	Inches			1.6	2.64	3.44	5.04	5.92	16.84	4.16	5.32	6.52	7.12	13.07
	Acre-feet			0.28	0.46	0.60	0.88	1.03	2.93	0.72	0.93	1.14	1.24	2.38
Leach Area 2	Pit	10.71	100	0.95	1.35	1.65	2.20	2.50	6.0	1.90	2.30	2.70	2.90	5.0
	Watershed	4.78	90	0.29	0.57	0.80	1.27	1.53	4.85	1.01	1.35	1.71	1.89	3.88
	Total	15.49	97	0.66	1.04	1.33	1.87	2.16	5.64	1.57	1.97	2.36	2.56	4.67
Total runoff to be held in Leach Pit 2	Inches			1.1	1.60	2.00	2.77	3.18	8.16	2.35	2.90	3.46	3.74	6.73
	Acre-feet			0.96	1.43	1.79	2.47	2.84	7.29	2.10	2.59	3.09	3.34	6.01
Leach Area 3	Pit	15.21	100	0.95	1.35	1.65	2.20	2.50	6.0	1.90	2.30	2.70	2.90	5.0
	Watershed	26.48	90	0.29	0.57	0.80	1.27	1.53	4.85	1.01	1.35	1.71	1.89	3.88
	Total	41.69	94	0.46	0.80	1.07	1.58	1.87	5.30	1.30	1.68	2.06	2.25	4.31
Total runoff to be held in Leach Pit 3	Inches			1.45	2.34	3.04	4.41	5.16	14.44	3.66	4.65	5.68	6.19	11.75
	Acre-feet			1.84	2.97	3.86	5.59	6.44	18.31	4.64	5.89	7.20	7.85	14.90
Leach Area 4	Pit	7.61	100	0.95	1.35	1.65	2.20	2.50	6.0	1.90	2.30	2.70	2.90	5.0
	Watershed	14.36	90	0.29	0.57	0.80	1.27	1.53	4.85	1.01	1.35	1.71	1.89	3.88
	Total	21.97	93	0.41	0.74	1.0	1.50	1.78	5.18	1.22	1.59	1.97	2.16	4.20
Total runoff to be held by Leach Pit 4	Inches			1.50	2.43	3.16	4.60	5.39	15.15	3.81	4.85	5.93	6.47	12.32
	Acre-feet			0.95	1.54	2.00	2.91	3.42	9.6	2.41	3.07	3.76	4.10	7.81